WHAT IS CLAIMED IS:

1. A method for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels in an optical cross-connect switch, which comprises determining an absolute position of at least one element in said switch, said element capable of at least one of: directing said one output channel so as to receive said one input optical channel and directing said one input optical signal so as to be received by said one output channel.

2. A method according to claim 1, wherein said determining step further comprises measuring the absolute position using an absolute position encoder.

3. A method for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels in an optical cross-connect switch, which comprises determining a position of at least one element in said switch using an absolute position encoder, said element capable of at least one of: directing said one output channel so as to receive said one input optical channel and directing said one input optical signal so as to be received by said one output channel.

4. A method for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels in an optical cross-connect switch, which comprises determining an absolute position of at least one of: a receiving

end of said one output channel and a transmitting end of an input signal channel associated with said one input optical signal.

5. A method according to claim 4, wherein said determining step further comprises measuring the absolute position using an absolute position encoder.

6. A method for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels in an optical cross-connect switch, which comprises determining a position, using an absolute position encoder, of at least one of: a receiving end of said one output channel and a transmitting end of an input signal channel associated with said one input optical signal.

7. A method of establishing optical communication in an optical cross-connect switch between a first optical fiber and a second optical fiber selected from a plurality of optical fibers, said method comprising the step of detecting a position, using an absolute encoder, of at least one of:

(a) an end of said first optical fiber;

(b) an end of said second optical fiber;

(c) an optical element operative to influence an optical path between said first and second optical fibers; and

(d) a plurality of optical elements operative to influence an optical path between said first and second optical fibers.

8. A method according to claim 7, which further comprises the step of moving at least one of

(a) an end of said first optical fiber;

(b) an end of said second optical fiber;

(c) an optical element operative to influence an optical path between said first and second optical fibers; and

(d) a plurality of optical elements operative to influence an optical path between said first and second optical fibers,

to a desired position, so as to establish optical communication between said first and second optical fibers.

9. An apparatus for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels, said apparatus comprising at least one absolute position encoder operative to detect a position of at least one element in said apparatus, the position of said element influencing at least one of: an alignment of said one output channel and an optical path for transmission of said one optical signal toward said one output signal channel.

10. An apparatus for an optical fiber cross-connect switch comprising at least one absolute encoder operative to detect a position of at least one element in said optical fiber cross-connect switch, the position of said element influencing an optical path for transmission of optical signals between two selected optical fibers in said switch.

11. An optical cross-connect switch comprising:

(a) a plurality of optical fibers operative to carry optical signals,

and for each of said fibers:

(b) a moveable element, a position of which influences an optical path of optical signals that are transmitted between that fiber and another selected fiber; and

(c) an absolute encoder operative to measure the position of said moveable element.

12. An optical fiber switch according to claim 11, which, for each of said fibers, further comprises an actuation mechanism operative to move said moveable element to a desired position, so as to facilitate optical communication between that fiber and another selected fiber.

13. An optical fiber cross-connect switch comprising first and second groups of optical fiber switching units, disposed in optically opposing relation, each of a plurality of the switching units in one of said first and second groups further comprising

(a) an optical fiber operative to conduct optical signals; and

(b) an absolute position encoder operative to detect a position of at least one of: (i) an end of said optical fiber; (ii) a optical element operative to influence an optical path of optical signals associated with said fiber; and (iii) a

plurality of optical elements operative to influence an optical path of optical signals associated with said fiber.

14. An optical fiber switch according to claim 13, wherein each of the plurality of switching units in one of said first and second groups further comprises an actuation mechanism operative to move at least one of:

(a) the end of said optical fiber;

(b) the optical element operative to influence the optical path of optical signals associated with said fiber; and

(c) the plurality of optical elements operative to influence the optical path of optical signals associated with said fiber,

to a desired position, so as to facilitate transmission of optical signals between the fiber associated with that switching unit and another fiber associated with another selected switching unit in an opposing one of said first and second groups.

15. A method, in an optical cross-connect switch, for directing an optical beam from any one of a plurality of input optical apertures to any one of a plurality of output optical apertures, said method comprising

(a) maintaining a fixed spatial relationship between an input reference pattern and each of said plurality of input optical apertures, said reference pattern being common to each of said input optical apertures;

(b) maintaining a fixed spatial relationship between an output reference pattern and each of said plurality of output optical apertures, said reference pattern being common to each of said output optical apertures;

(c) directing said optical beam between said one input optical aperture and said one output optical aperture using information obtained from at least one of said input reference pattern and said output reference pattern.

16. A method according to claim 15, which further comprises the step of establishing at least one of said output reference pattern and said input reference pattern using a plurality of radiation sources.

17. A method according to claim 16, wherein said establishing step further comprises switching various radiation source from said plurality of radiation sources between an on state and an off state to generate a pattern of reference radiation points.

18. A method according to claim 17, wherein said establishing step further comprises changing said pattern of reference radiation points with time in a known sequence.

19. A method according to claim 18, wherein said directing step is accomplished by moving at least one of the following components:

(a) an end of a conduit for transmitting said optical beam;

(b) an end of a conduit for receiving said optical beam;

(c) an end of an optical fiber for transmitting said optical beam;

(d) an end of optical fiber for receiving said optical beam;

(e) at least one element within a path of said optical beam, said element capable of being positioned so as to affect the path of said optical beam; and

(f) a micro-machined electrostatic mechanical system within a path of said optical beam, said system capable of affecting the path of said optical beam.

20. A method according to claim 15, wherein said directing step is accomplished by moving at least one of the following components:

(a) an end of a conduit for transmitting said optical beam;

(b) an end of a conduit for receiving said optical beam;

(c) an end of an optical fiber for transmitting said optical beam;

(d) an end of optical fiber for receiving said optical beam;

(e) at least one element within a path of said optical beam, said element capable of being positioned so as to affect the path of said optical beam; and

(f) a micro-machined electrostatic mechanical system within a path of said optical beam, said system capable of affecting the path of said optical beam.

21. A method according to claim 20, wherein said moving step further comprises creating relative motion between a predetermined spatial pattern and an image of one of: said output reference pattern and said input reference pattern, said relative motion corresponding to movement of said component.

22. A method according to claim 21, which further comprises maintaining a fixed spatial relationship between said predetermined spatial pattern and said component.

23. A method according to claim 21, wherein said predetermined spatial pattern is a reticle.

24. A method according to claim 20, wherein said moving step is accomplished by a magnetic actuator.

25. A method according to claim 21, wherein said creating step further comprises detecting a Moiré interference pattern that results from said relative motion.

26. An apparatus for directing an optical beam from any one of a plurality of input optical apertures to any one of a plurality of output optical fibers comprising:

(a) an input reference pattern maintained at a fixed spatial relationship with respect to each of said plurality of input optical apertures, said reference pattern being common to each of said input optical apertures;

(b) an output reference pattern maintained at a fixed spatial relationship with respect to each of said plurality of output

optical apertures, said reference pattern being common to each of said output optical apertures;

at least one of said input and output reference patterns being operative to provide information used to direct said optical beam between said one input optical aperture and said one output optical aperture.

27. An apparatus according to claim 26, wherein at least one of said input and output reference patterns further comprise a plurality of radiation sources.

28. An apparatus according to claim 27, wherein various radiation sources from said plurality of radiation sources are switched between an on state and an off state, so as to generate a pattern of reference radiation points.

29. An apparatus according to claim 28, wherein said pattern of reference points is changed in time in a known sequence.

30. An apparatus according to claim 29, which further comprises at least one of the following moveable components:

(a) an end of a conduit operative to transmit said optical beam;

(b) an end of a conduit operative to receive said optical beam;

(c) an end of an optical fiber operative to transmit said optical beam;

(d) an end of optical fiber operative to receive said optical beam;

(e) at least one element located in a path of said optical beam, said element capable of being positioned so as to affect the path of said optical beam; and

(f) a micro-machined electrostatic mechanical system located in a path of said optical beam, said system capable of affecting the path of said optical beam

and wherein movement of said element is operative to direct said optical beam between said one input optical aperture and said one output optical aperture in accordance with the information supplied by at least one of said input and output reference patterns.

31. An apparatus according to claim 26, which further comprises at least one of the following moveable components:

(a) an end of a conduit operative to transmit said optical beam;

(b) an end of a conduit operative to receive said optical beam;

(c) an end of an optical fiber operative to transmit said optical beam;

(d) an end of optical fiber operative to receive said optical beam;

(e) at least one element located in a path of said optical beam, said element capable of being positioned so as to affect the path of said optical beam; and

(f) a micro-machined electrostatic mechanical system located in a path of said optical beam, said system capable of affecting the path of said optical beam

and wherein movement of said element is operative to direct said optical beam between said one input optical aperture and said one output optical aperture in accordance with the information supplied by at least one of said input and output reference patterns.

32. An apparatus according to claim 31, which further comprises a predetermined spatial pattern, and wherein movement of said element causes relative motion between said predetermined spatial pattern and an image of one of said input and output reference patterns, said relative motion corresponding to movement of said component.

33. An apparatus according to claim 32, wherein said predetermined spatial pattern is maintained at a fixed spatial relationship to said component and is moveable therewith.

34. An apparatus according to claim 32, wherein said predetermined spatial pattern is a reticle.

35. An apparatus according to claim 31, which further comprises a magnetic actuator operative to cause movement of said component.

36. An apparatus according to claim 32, wherein said relative motion creates a Moiré interference pattern.

37. A method for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels in an optical cross-connect switch, which comprises detecting a Moiré interference pattern and determining therefrom a position of at least one element in said switch, said element capable of at least one of: directing said one output channel so as to receive said one input optical channel and directing said one input optical signal so as to be received by said one output channel.

38. A method for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels in an optical cross-connect switch, which comprises detecting a Moiré interference pattern and determining therefrom a position of at least one of: a receiving end of said one output channel and a transmitting end of an input signal channel associated with said one input optical signal.

39. A method of establishing optical communication in an optical cross-connect switch between a first optical fiber and a second optical fiber selected from a plurality of optical fibers, said method comprising the step of detecting a Moiré interference pattern and determining therefrom a position of at least one of:

(a) an end of said first optical fiber;

(b) an end of said second optical fiber;

(c) an optical element operative to influence an optical path between said first and second optical fibers; and

(d) a plurality of optical elements operative to influence an optical path between said first and second optical fibers.

40. An apparatus for directing any one of a plurality of input optical signals to any one of a plurality of output signal channels, said apparatus comprising at least one position encoder operative to detect a Moiré interference pattern and determine therefrom a position of at least one element in said apparatus, the position of said element influencing at least one of: an alignment of said one output channel and an optical path for transmission of said one optical signal toward said one output signal channel.

41. An apparatus for an optical fiber cross-connect switch comprising at least one encoder operative to detect a Moiré interference pattern and determine therefrom a position of at least one element in said optical fiber cross-connect switch, the position of said element influencing an optical path for transmission of optical signals between two selected optical fibers in said switch.

42. An optical cross-connect switch comprising:

(a) a plurality of optical fibers operative to conduct optical signals,

and for each of said fibers:

(b) a moveable element, a position of which influences an optical path of optical signals that are transmitted between that fiber and another selected fiber; and

(c) an encoder operative to detect a Moiré interference pattern and use it to measure the position of said moveable element.

43. An optical fiber cross-connect switch comprising first and second groups of optical fiber switching units, disposed in optically opposing relation, each of a plurality of the switching units in one of said first and second groups further comprising

(a) an optical fiber operative to conduct optical signals; and

(b) a position encoder operative to detect Moiré interference pattern and determine therefrom a position of at least one of: (i) an end of said optical fiber; (ii) a optical element operative to influence an optical path of optical signals associated with said fiber; and (iii) a plurality of optical elements operative to influence an optical path of optical signals associated with said fiber.

44. A method of implementing an optical fiber cross-connect switch comprising the step of detecting a position of at least one element in said optical fiber cross-connect switch using an absolute position encoder, the position of said element influencing an optical path for transmission of optical communication signals between two selected fibers in said switch.

45. A method of implementing an optical fiber cross-connect switch comprising the steps of:

(a) providing a plurality of optical fibers operative to conduct optical communication signals,

and for each of said fibers:

(b) detecting a position of at least one element associated with that fiber using an absolute position encoder, the position of said element influencing an optical path for transmission of optical communication signals between that fiber and another selected fiber.

46. A method according to claim 45, which, for each of said fibers, further comprises the step of moving said element to a desired position, said desired position aligning an optical path between an end of that fiber and another selected fiber and facilitating transmission of optical communication signals therebetween.

47. A method of facilitating optical communication between a first optical fiber and a second optical fiber selected from a plurality of optical fibers associated with an optical fiber cross-connect switch, comprising the step of detecting a position, using an absolute encoder, of at least one of: (a) an end of said first optical fiber; (b) an end of said second optical fiber; (c) an optical element operative to influence an optical path between said first and second optical fibers; and (d) a plurality of optical elements operative to influence an optical path between said first and second optical fibers.

48. An apparatus for an optical fiber cross-connect switch comprising at least one absolute encoder operative to detect a position of at least one element in said optical fiber cross-connect switch, the position of said element influencing an

optical path for transmission of optical communication signals between two selected fibers in said switch.

49. An optical cross-connect switch comprising:

(a) a plurality of optical fibers operative to conduct optical communication signals,

and for each of said fibers:

(b) a moveable element, a position of which influences an optical path of optical communication signals that are transmitted between that fiber and another selected fiber; and

(c) an absolute encoder operative to measure the position of said moveable element.

50. A method of implementing an optical cross-connect switch between a first group of optical switching units a second group of optical switching units, comprising the steps of:

(a) providing a plurality of radiation sources operative to emit control signal radiation, said radiation sources being shared by each of said first group of switching units,

and in each of said first group of switching units, said method further comprising the step of:

(b) receiving control signal radiation from each of said plurality of radiation sources;

(c) detecting a position of a beam steering element associated with that switching unit based on information obtained from said receiving step; and

(d) aligning an optical communication signal radiation beam between that switching unit and a selected one of said second group of switching units.

51. A method according to claim 50, which further comprises the steps of:

(a) providing a second plurality of radiation sources operative to emit control signal radiation, said radiation sources being shared by each of said second group of switching units,

and in each of said second group of switching units, said method further comprising the step of:

(b) receiving control signal radiation from each of said second plurality of radiation sources;

(c) detecting a position of a beam steering element associated with that switching unit based on information obtained from said receiving step; and

(d) aligning an optical communication signal radiation beam between that switching unit and a selected one of said first group of switching units.

52. An optical cross-connect switch for aligning optical communication signals between a first group of optical switching

units a selected one of a second group of optical switching units, comprising:

(a) a plurality of radiation sources operative to emit control signal radiation, said radiation sources being shared by each of said first group of switching units,

and each of said first group of switching units further comprising:

(b) an optical system operative to receive control signal radiation from each of said plurality of radiation sources;

(c) an encoder operative to use said control signal radiation to detect a position of a beam steering element associated with that switching unit.

53. An optical cross-connect switch according to claim 52, which further comprises:

(a) a second plurality of radiation sources operative to emit control signal radiation, said radiation sources being shared by each of said second group of switching units,

and each of said second group of switching units further comprising:

(b) an optical system operative to receive control signal radiation from each of said second plurality of radiation sources;

(c) an encoder operative to use said control signal radiation to detect a position of a beam steering element associated with that switching unit.

54. An optical fiber cross-connect switch, comprising:

(a) a support chassis;

(b) a plurality of rigidly mounted radiation sources, operative to emit control signal radiation that is incident on said support chassis;

(c) first and second groups of optical fiber switching units, disposed in optically opposing relation by said support chassis, each of a plurality of the switching units in one of said first and second groups comprising:

(i) a housing framework mounted on said support chassis;

(ii) an optical fiber having a central axis, said optical fiber being mounted on said housing framework in a manner such that said fiber is substantially rigid over a portion of its length and said optical fiber is bendable in a manner allowing movement of an end portion of said fiber about the substantially rigid central axis;

(iii) an actuation system operative to bend the end portion of said fiber in response to actuation signals;

(iv) a reticle affixed to the end portion of said fiber, said reticle having a predetermined spatial relation to an end of said fiber and being moveable therewith;

(v) an optical system operative to project the control signal radiation, so as to create images of at least two of said radiation sources on a surface said reticle;

(vi) a photodetector operative to measure intensity of the control signal radiation transmitted through said reticle;

(vii) a control system, operative to:

(A) receive the measured intensity of the control signal radiation transmitted through said reticle and resolve a Moiré interference pattern therefrom;

(B) determine an actual position of the end of said fiber on two dimensions; and

(C) generate said actuation signals, said actuation signals causing said actuation system to bend the end portion of said fiber and to move the end of said fiber to a desired position, so as to effect a switching operation.

55. An optical fiber switch according to claim 54, wherein said reticle is positioned and affixed circumferentially around the end portion of said optical fiber.

56. An optical fiber switch according to claim 54, wherein said control system is further operative to generate said actuation signals based on information about the present and historic actual position of the end of said fiber and the desired position of the end of said fiber.

57. An optical fiber switch according to claim 54, wherein said support chassis is divisible into a first chassis element operative to house said first group of optical switching units and a second chassis element operative to house said second group of optical switching units.

58. An optical fiber switch according to claim 54, wherein said radiation sources are radiation emitting diodes.

59. An optical fiber switch according to claim 58, wherein said radiation emitting diodes are grouped into a plurality of radiation stripes and said radiation stripes are grouped into a plurality of radiation banks, and said radiation emitting diodes are selectively controllable so as to time division multiplex pulses of control signal radiation from various radiation stripes.

60. An optical fiber switch according to claim 59, wherein said control system is further operative to provide timing information to multiplex the pulses of control signal radiation emitted by the various radiation stripes and to de-multiplex the pulses of control signal radiation measured by said photodetector, so as to individually discern the measured intensity of the pulses.

61. An optical fiber switch according to claim 54, wherein said radiation sources are themselves comprised of groups of radiation emitting diodes.

62. An optical fiber switch according to claim 61, wherein said radiation emitting diodes are selectively controllable, so as to time division multiplex pulses of control signal radiation from the various groups of radiation emitting diodes, and said control system is further operative to provide timing information to multiplex the pulses of control signal radiation emitted by the various groups of radiation emitting diodes and to de-multiplex the pulses of control signal radiation measured by said photodetector, so as to individually discern the measured intensity of the pulses.

63. An optical fiber switch according to claim 54, wherein said control system is further operative to determine an absolute actual position of the end of said fiber on two dimensions.

64. An optical fiber switch according to claim 63, wherein said reticle is fabricated to have surface properties, which comprise one of:

(a) non-transmissive areas and apertures, that define a plurality of cells, each of said plurality of cells having a constant cellular pitch, and said plurality of cells having an aperture duty cycle that varies in a known manner from cell to cell over two orthogonal dimensions;

(b) non-transmissive areas and apertures, such that said non-transmissive areas and said apertures form concentric annular regions; and

(c) non-transmissive areas and apertures, that define a plurality of cells, each of said plurality of cells having a constant cellular pitch, and said plurality of cells having an aperture duty cycle that varies in a known manner from cell to cell over two orthogonal dimensions, the known manner of variation of the aperture duty cycle being periodic over the surface of said reticle.

65. An optical fiber switch according to claim 54, wherein the surface of said reticle further comprises a plurality of materials, each of which has wavelength dependent transmission properties and said plurality of radiation sources further comprises groups of radiation sources having different wavelengths.

66. An optical fiber switch according to claim 54, wherein the surface of said reticle further comprises a plurality of materials, each of which has polarization dependent transmission properties and one of: said plurality of radiation sources and said optical system, is further operative to polarize said control signal radiation in a plurality of manners.

67. An optical fiber switch according to claim 54, wherein said control system is further operative to discern rotation of the end portion of said fiber.

68. An optical fiber cross-connect switch, comprising:

(a) a support chassis;

(b) a plurality of rigidly mounted radiation sources, operative to emit control signal radiation that is incident on said support chassis;

(c) first and second groups of optical fiber switching units, disposed in optically opposing relation by said support chassis, each of a plurality of the switching units in one of said first and second groups comprising:

(i) a housing framework mounted on said support chassis;

(ii) an optical fiber having a central axis, said optical fiber being mounted on said housing framework in a manner such that said fiber is substantially rigid over a portion of its length and said optical fiber is bendable in a manner allowing movement of an end portion of said fiber about the substantially rigid central axis;

(iii) an actuation system operative to bend the end portion of said fiber in response to actuation signals;

(iv) an encoder associated with an end of said optical fiber, said encoder operative to determine an actual position of the end of said fiber on two dimensions;

(v) a control system operative to generate said actuation signals based on information related to the present and historic actual position of the end of said fiber and a desired position of the end of said fiber, said actuation signals causing said actuation system to bend the end portion of said fiber and to move the end of said fiber to the desired position, so as to effect a switching operation.

69. An apparatus for use in an optical cross-connect switch for selectively facilitating connection between first and second optical fibers via an optical path extending across a switch interface between said first and second optical fibers, comprising:

(a) a first reticle affixed to an end portion of said first fiber and moveable therewith;

(b) a second reticle affixed to an end portion of said second fiber and moveable therewith;

(c) a plurality of rigidly mounted radiation sources and associated optics, operative to emit control signal radiation, a first portion of said control signal radiation being optically projected onto a surface of said first reticle and a second portion of said control signal radiation being optically projected onto a surface of said second reticle;

(d) a first photodetector operative to detect and measure a fraction of the first portion of said control signal radiation that is transmitted through said first reticle;

(e) a second photodetector operative to detect and measure a fraction of the second portion of said control signal radiation that is transmitted through said second reticle;

(f) at least one controller operative to use measurements from said first and second photodetectors to control an actuation system to align said first and second fibers, so as to configure said optical path extending across said switch interface for facilitating connection between said first and second optical fibers.

70. A fiber position control system for use in optically connecting a first fiber end of a first optical fiber with a second fiber end of a second optical fiber, so as to permit optical communication between said first and second fibers, comprising:

(a) a first reticle affixed to an end portion of said first fiber and moveable therewith;

(b) a second reticle affixed to an end portion of said second fiber and moveable therewith;

(c) a first plurality of stationary radiation sources and associated optics operative to emit first control signal radiation, said first control signal radiation being optically projected onto a surface of said first reticle;

(d) a second plurality of stationary radiation sources and associated optics operative to emit second control signal radiation, said second control signal radiation being optically projected onto a surface of said second reticle;

(e) a first photodetector operative to detect and measure a portion of said first control signal radiation that is transmitted through said first reticle;

(f) a second photodetector operative to detect and measure a portion of said second control signal radiation that is transmitted through said second reticle; and

(g) a controller operative to use measurement from said first and second photodetectors to control an actuation system to align said first and second fibers, so as to configure an optical path for optically connecting said first and second fiber ends to facilitate optical communication between said first and second fibers.

71. A method of aligning an end of an optical fiber to a desired position on two dimensions, comprising the steps of:

(a) providing a plurality of radiation sources, which emit control signal radiation;

(b) affixing a reticle in a predetermined spatial relation to the end of said fiber, said reticle being moveable along with the end of said fiber, while maintaining the predetermined relation therewith;

(c) projecting the control signal radiation onto said reticle, so as to produce images of said radiation sources on a surface of said reticle;

(d) detecting and measuring intensity of a Moiré interference pattern produced by a portion of the control signal radiation that is transmitted through said reticle and determining therefrom an actual position of the end of said fiber on two dimensions;

(e) generating actuation signals based on information related to the present and historic actual position of the end of said fiber and the desired position of the end of said fiber;

(f) moving said fiber in response to said actuation signals; and

(g) repeating steps (c) through (f) to ensure that the end of said fiber reaches the desired position and remains substantially in the desired position.

72. A method according to claim 71, wherein said radiation sources are radiation emitting diodes;

73. A method according to claim 71, wherein said projecting step (c) further comprises time division multiplexing pulses of control signal radiation from various groups of radiation sources within said plurality of radiation sources and said detecting step (d) further comprises de-multiplexing the pulses of control signal radiation from the various groups of radiation sources.

74. A method according to claim 73, which further comprises the step of providing timing information about the multiplexing of the pulses of said groups of radiation sources.

75. A method according to claim 71, wherein said detecting step (d) further comprises the step of determining an absolute actual position of the end of said fiber on two dimensions.

76. A method according to claim 71, wherein said detecting step (d) further comprises the step of discerning rotation of the end of said fiber.

77. A method of aligning an end of an optical fiber to a desired position on two dimensions, so as to establish a connection with a target optical fiber among a plurality of optical fibers, comprising the steps of:

(a) providing a plurality of radiation sources, which emit control signal radiation;

(b) affixing a reticle in a predetermined spatial relation to the end of said fiber, said reticle being moveable along with the end of said fiber, while maintaining the predetermined relation therewith;

(c) projecting the control signal radiation onto said reticle, so as to produce images of said radiation sources on a surface of said reticle and to generate a detectable Moiré interference pattern of radiation transmitted through said reticle, said Moiré interference pattern providing

information about an actual position of the end of said fiber on two dimensions; and

(d) moving the end of said fiber so as to minimize a difference between the actual position of the end of said fiber and the desired position of the end of said fiber.

78. A position measurement system for determining a position on two dimensions of a moveable end portion of a fiber in an optical cross-connect switch, comprising:

(a) a reticle affixed to an end portion of said fiber, said reticle having a predetermined spatial relation to the end of said fiber and being moveable therewith;

(b) a plurality of stationary radiation sources operative to emit control signal radiation;

(c) an optical system operative to project the control signal radiation, so as to create images of said radiation sources on a surface of said reticle;

(d) a photodetector operative to measure intensity of the control signal radiation transmitted through said reticle; and

(e) a control system operative to:

(i) receive the measured intensity of the control signal radiation transmitted through said reticle and resolve a Moiré interference pattern therefrom;

(ii) determine the position of the end of said fiber on two dimensions based on information obtained from the Moiré interference pattern.

79. A method of measuring a position on two dimensions of a moveable end of a fiber in an optical-cross connect switch, comprising the steps of:

(a) providing a plurality of radiation sources, which emit control signal radiation;

(b) affixing a reticle in a predetermined spatial relation to the end of said fiber, said reticle being moveable along with the end of said fiber, while maintaining the predetermined relation therewith;

(c) projecting the control signal radiation onto said reticle, so as to produce images of said radiation sources on a surface of said reticle;

(d) detecting and measuring intensity of a Moiré interference pattern produced by a portion of the control signal radiation that is transmitted through said reticle; and

(e) calculating the position of the end of said fiber in two dimensions using information contained in the Moiré interference pattern.

80. An actuation system for moving an end of a fiber in an optical cross-connect switch on two dimensions, comprising:

(a) a housing framework operative to affix said fiber, such that a central axis of said fiber is substantially rigid over a portion of its length and said fiber is bendable in a manner allowing movement of an end portion of said fiber about the substantially rigid central axis;

(b) a magnetically responsive element, said magnetically responsive element affixed to the end portion of said fiber and moveable therewith;

(c) an actuation element, said actuation element disposed around a circumferential perimeter of said fiber in a location near to the substantially rigid central axis of said fiber and said actuation element further comprising a plurality of actuator branches, which actuator branches are disposed at regular intervals around the circumferential perimeter of said fiber and extend towards the end of said fiber, said actuator branches each having a coil of wire wrapped around at least a portion of their length;

(d) a plurality of individually controllable current sources, each of said current sources selectively operative to deliver a controllable amount of current to the coil of wire wrapped around one of said actuator branches, so as to create a magnetic field in the vicinity of said actuator branch, to create a magnetic force on said magnetically responsive element, and to move said fiber end.

81. An actuation system according to claim 80, wherein said actuation element is made out of a magnetically polarizable material.

82. An actuation system according to claim 81, wherein said actuation branches extend past the end of said fiber, so as to create a component of magnetic force oriented parallel to the central axis of said fiber, said component of magnetic force operative to prevent said fiber from bending in more than one location.

83. A method of moving an end of a fiber in an optical cross-connect switch on two dimensions, comprising the steps of:

(a) providing an actuation element, said actuation element disposed around a circumferential perimeter of said fiber in a location near to a substantially rigid portion of said fiber, said actuation element being comprised of a plurality of actuator branches, which actuator branches are disposed at regular intervals around the circumferential perimeter of said fiber and extend towards the end of said fiber, said actuator branches each having a coil of wire wrapped around their length;

(b) providing a magnetically responsive element which is affixed to the end portion of said fiber and is moveable therewith;

(c) introducing current into the coil of wire wrapped around at least one of said actuator branches, so as to create a magnetic field in the vicinity of said actuator branch, to

create a magnetic force on said magnetically responsive element, and to move said fiber end.